HPL 100345

HISTORY AND PHILOSOPHY OF LOGIC, **20** (2002), 00–00

Jaina Logic and the Philosophical Basis of Pluralism

JONARDON GANERI
Department of Philosophy, University of Liverpool

Received Month 2000 Revised Month 2000

What is the rational response when confronted with a set of propositions each of which we have some reason to accept, and yet which taken together form an inconsistent class? This was, in a nutshell, the problem addressed by the Jaina logicians of classical India, and the solution they gave is, I think, of great interest, both for what it tells us about the relationship between rationality and consistency, and for what we can learn about the logical basis of philosophical pluralism. The Jainas claim that we can continue to reason in spite of the presence of inconsistencies, and indeed construct a many-valued logical system tailored to the purpose. My aim in this paper is to offer a new interpretation of that system and to try to draw out some of its philosophical implications.

There was in classical India a great deal of philosophical activity. Over the years, certain questions came to be seen as fundamental, and were hotly contested. Are there universals? Do objects endure or perdure? Are there souls, and, if so, are they eternal or non-eternal entities? Do there exist wholes over and above collections of parts? Different groups of philosophers offered different answers to these and many other such questions, and each, moreover, was able to supply plausible arguments in favour of their position, or to offer a world-view from which their particular answers seemed true. The body of philosophical discourse collectively contained therefore, a mass of assertions and contradictory counter-assertions, behind each of which there lay a battery of plausible arguments. Such a situation is by no means unique to philosophical discourse. Consider, for instance, the current status of physical theory, which comprises two sub-theories, relativity and quantum mechanics, each of which is extremely well supported, and yet which are mutually inconsistent. The same problem is met with in computer science, where a central notion, that of putting a query to a data-base, runs into trouble when the data-base contains data which is inconsistent because it is coming in from many different sources. For another example of the general phenomenon under discussion, consider the situation faced by an investigator using multiple-choice questionnaires, when the answers supplied in one context are in conflict with those supplied in another. Has the interrogee said ‘yes’ or ‘no’ to a given question, when they said ‘yes’ under one set of conditions but ‘no’ under another? Do their answers have any value at all, or should we simply discard the whole lot on account of its inconsistency? Perhaps the most apposite example of all is the case of a jury being

History and Philosophy of Logic ISSN 0144-5340 print/ISSN 1464-5149 online
http://www.tandf.co.uk/journals
DOI: 10.1080/0144534021000051505

presented with the evidence from a series of witnesses. Each witness, we might suppose, tells a consistent story, but the total evidence presented to the jury might itself well be inconsistent.

The situation the Jainas have in mind is one in which a globally inconsistent set of propositions, the totality of philosophical discourse, is divided into sub-sets, each of which is internally consistent. Any proposition might be supported by others from within the same sub-set. At the same time, the negation of that proposition might occur in a distinct, though possibly overlapping subset, and be supported by other propositions within it. Each such consistent sub-set of a globally inconsistent discourse, is what the Jainas call a 'standpoint' (*naya*). A standpoint corresponds to a particular philosophical perspective.

Let us say that a proposition is *arguable* if it is assertible within some standpoint, i.e. if it is a member of a mutually supporting consistent set of propositions. The original problem posed was this: what is the rational reaction to a class of propositions, each of which is, in this sense, arguable, yet which is globally inconsistent? It seems that there are three broad types of response. The first, which I will dub *doctrinalism*, is to say that it will always be possible, in principle, to discover which of two inconsistent propositions is true, and which is false. Hence our reaction should be to reduce the inconsistent set to a consistent subset, by rejecting propositions which, on close examination, we find to be unwarranted. This is, of course, the ideal in philosophical debate, but it is a situation we are rarely if ever in. The problem was stipulated to be one such that we cannot decide, as impartial observers, which of the available standpoints, if any, is correct. If doctrinalism were the only option, then we would have no choice but to come down in favour of one or other of the standpoints, basing our selection, perhaps on historical, cultural or sociological considerations, but not on logical ones.

A second response is that of *scepticism*. Here the idea is that the existence both of a reason to assert and a reason to reject a proposition itself constitutes a reason to deny that we can justifiably either assert or deny the proposition. A justification of a proposition can be defeated by an equally plausible justification of its negation. This sceptical reaction is at the same time a natural and philosophically interesting one, and indeed has been adopted by some philosophers, notably Nāgārjuna in India and the Pyrrhonic sceptics as reported by Sextus Empiricus. Sextus, indeed states as the first of five arguments for scepticism, that philosophers have never been able to agree with one another, not even about the criteria we should use to settle controversies.

The third response is that of *pluralism*, and this is the response favoured by the Jainas. The pluralist finds some way conditionally to assent to each of the propositions, and she does so by recognising that the justification of a proposition is internal to a standpoint. In this way, the Jainas try "to establish a rapprochement between seemingly disagreeing philosophical schools (Matilal 1977: 61)", thereby avoiding the dogmatism or "one-sidedness" from which such disagreements flow. Hence another name for their theory was *anekāntavāda*, the doctrine of "non-one-sidedness" (for a good outline of these aspects of Jaina philosophical theory, see Matilal 1977 and Dundas 1992).

In spite of appearances to the contrary, the sceptic and the pluralist have much in common. For although the sceptic rejects all the propositions while the pluralist endorses all of them, they both deny that we can solve the problem by privileging just one position, i.e. by adopting the position of the doctrinalist. (It seems, indeed,

that scepticism and pluralism developed in tandem in India, both as critical reactions to the system-based philosophical institutions.) Note too that both are under pressure to revise classical logic. For the sceptic, the problem is with the law of excluded middle, the principle that for all p, either p or $\neg p$. The reason this is a problem for the sceptic is that she wishes to reject each proposition p without being forced to assent to its negation $\neg p$. The pluralist, on the other hand, has trouble with a different classical law, the law of non-contradiction, that for all p, it is not the case both that p and that $\neg p$, for she wishes to assent both to the proposition p and to its negation. While a comparative study of the two responses, sceptical and pluralist, would be of interest, I will here confine myself to developing the version of pluralism developed by the Jainas, and discussing the extent to which their system becomes paraconsistent. It is very often claimed that the Jainas 'embrace' inconsistency, but I will be arguing that this is not so, that we can understand their system by giving it a less strongly paraconsistent reading.

1. Jaina Seven-valued Logic

The Jaina philosophers support their pluralism by constructing a logic in which there are seven distinct semantic predicates (*bhaṅgī*), which, since they attach to sentences, we *might* think of as truth-values (for a rather different interpretation, see Ganeri 2001, chapter 5). I will first set out the system following the mode of description employed by the Jainas themselves, before attempting to reconstruct it in a modern idiom. I will follow here the twelfth century author Vādideva Sūri (1086–1169 AD), but similar descriptions are given by many others, including Prabhācandra, Malliṣena and Samantabhadra. This is what Vādideva Sūri says (*Pramāṇa-naya-tattvālokālaṅkāraḥ*, chapter 4, verses 15–21):

> The seven predicate theory consists in the use of seven claims about sentences, each preceded by "arguably" or "conditionally" (*syāt*), [all] concerning a single object and its particular properties, composed of assertions and denials, either simultaneously or successively, and without contradiction. They are as follows:

(1) Arguably, it (i.e. some object) exists (*syād asty eva*). The first predicate pertains to an assertion.
(2) Arguably, it does not exist (*syān nāsty eva*). The second predicate pertains to a denial.
(3) Arguably, it exists; arguably, it doesn't exist (*syād asty eva syān nāsty eva*). The third predicate pertains to successive assertion and denial.
(4) Arguably, it is 'non-assertible' (*syād avaktavyam eva*). The fourth predicate pertains to a simultaneous assertion and denial.
(5) Arguably, it exists; arguably it is non-assertible (*syād asty eva syād avaktavyam eva*). The fifth predicate pertains to an assertion and a simultaneous assertion and denial.
(6) Arguably, it doesn't exist; arguably it is non-assertible (*syān nāsty eva syād avaktavyam eva*). The sixth predicate pertains to a denial and a simultaneous assertion and denial.
(7) Arguably, it exists; arguably it doesn't exist; arguably it is non-assertible (*syād asty eva syān nāsty eva syād avaktavyam eva*). The seventh predicate pertains to a successive assertion and denial and a simultaneous assertion and denial.

The structure here is simple enough. There are three basic truth-values, true (t), false (f) and non-assertible (u). There is also some means of combining basic truth-values, to form four further compound values, which we can designate tf, tu, fu and tfu. There is a hint too that the third basic value is itself somehow a product of the first two, although by some other means of combination—hence the talk of simultaneous and successive assertion and denial. Thus, in Jaina seven valued logic, all the truth-values are thought to be combinations in some way or another of the two classical values.

There is, however, a clear risk that the seven values in this system will collapse trivially into three. For if the fifth value, tu, means simply "true and true-and-false", how is it distinct from the fourth value, u, "true-and-false"? No reconstruction of the Jaina system can be correct if it does not show how each of the seven values is distinct. The way through is to pay due attention to the role of the conditionalising operator "arguably" (*syāt*). The literal meaning of "*syāt*" is "perhaps it is", the optative form of the verb "to be". The Jaina logicians do not, however, use it in quite its literal sense, which would imply that no assertion is not made categorically, but only as a possibility-claims. Instead, they use it to mean "from a certain standpoint" or "within a particular philosophical perspective". This is the Jaina pluralism: assertions are made categorically, but only from within a particular framework of supporting assertions. If we let the symbol "∇" represent "*syāt*", then the Jaina logic is a logic of sentences of the form "∇p", a logic of conditionally justified assertions. As we will see, it resembles other logics of assertion, especially the ones developed by Jaśkowski (1948) and Rescher (1968).

The first three of the seven predications now read as follows:

$$(1)\ /p/ = \text{t iff } \nabla p$$

In other words, p is true iff it is arguable that p. We are to interpret this as saying that there is some standpoint within which p is justifiably asserted. We can thus write it as

$$(1)\ /p/ = \text{t iff } \exists\sigma\ \sigma : p,$$

where "$\sigma : p$" means that p is arguable from the standpoint σ. For the second value we may similarly write,

$$(2)\ /p/ = \text{f iff } \nabla \neg p.$$

That is,

$$/p/ = \text{f iff } \exists\sigma\ \sigma : \neg p.$$

The third value is taken by those propositions whose status is controversial, in the sense that they can be asserted from some standpoints but their negations from others. These are the propositions which the Jainas are most concerned to accommodate. Thus

$$(3)\ /p/ = \text{tf iff } /p/ = \text{t} \ \&\ /p/ = \text{f}.$$

I.e.

$$/p/ = \text{tf iff } \nabla p \ \&\ \nabla \neg p,$$

or again

$$/p/ = \text{tf iff } \exists\sigma\ \sigma : p \ \&\ \exists\sigma\ \sigma : \neg p.$$

This way of introducing a new truth-value, by combining two others, may seem a little odd. I think, however, that we can see the idea behind it if we approach matters from another direction. Let us suppose that every standpoint is such that for any given proposition, either the proposition or its negation is assertible from within that standpoint. Later, I will argue that the Jainas did not want to make this assumption, and that this is what lies behind their introduction of the new truth-value "non-assertible". But for the moment let us make the assumption, which is tantamount to supposing that every standpoint is "*optimal*", in the sense that for any arbitrary proposition, it either supplies grounds for accepting it, or else grounds for denying it. There are no propositions about which an optimal standpoint is simply indifferent. Now, with respect to the totality of actual optimal standpoints, a proposition can be in just one of three states: either it is a member of every optimal standpoint, or its negation is a member of every such standpoint, or else it is a member of some, and its negation of the rest. If we number these three states, 1, 2 and 3, and call the totality of all actual standpoints, Σ, then the value of any proposition with respect to Σ is either 1, 2 or 3. The values 1, 2 and 3 are in fact the values of a three-valued logic, which we can designate **M3**. I will argue below that there is a correspondence between this logic and the system introduced by the Jainas (**J3**, say). The idea, roughly is that a proposition has the value 'true' iff it either has the value 1 or 3, it has the value 'false' iff it either has the value 2 or 3, and it has the value 'tf' iff it has the value 3. Hence the three values introduced by the Jainas represent, albeit indirectly, the three possible values a proposition may take with respect to the totality of optimal standpoints.

Before elaborating this point further, we must find an interpretation for the Jainas' fourth value "non-assertible". Bharucha and Kamat offer the following analysis of the fourth value:

> The fourth predication consists of affirmative and negative statements made simultaneously. Since an object X is incapable of being expressed in terms of existence and non-existence at the same time, even allowing for Syād, it is termed 'indescribable'. Hence we assign to the fourth predication ... the indeterminate truth-value I and denote the statement corresponding to the fourth predication as (p & $\neg p$). (1984: 183)

Bharucha and Kamat's interpretation is equivalent to:

$$(4)/p/ = \text{u iff } \nabla(p \ \& \ \neg p),$$

that is

$$/p/ = \text{u iff } \exists\sigma\ \sigma : (p \ \& \ \neg p).$$

Thus, for Bharucha and Kamat, the Jaina system is paraconsistent because it allows for standpoints in which contradictions are justifiably assertible. This seems to me to identify the paraconsistent element in the Jaina theory in quite the wrong place. For while there may be certain sentences, such as the Liar, which can justifiably be both asserted and denied, this cannot be the case for the wide variety of sentences which the Jainas have in mind, sentences like "There exist universals" and so on. Even aside from such worries, the current proposal has a technical defect. For what now is the fifth truth-value, tu? If Bharucha and Kamat are right then it means that there is some standpoint from which 'p' can be asserted, and some from which 'p &

$\neg p$' can be asserted. But this is logically equivalent to u itself. The Bharucha and Kamat formulation fails to show how we get to a *seven*-valued logic.

Another proposed interpretation is due to Matilal. Taking at face-value the Jainas' elaboration of the fourth value as meaning "simultaneously both true and false", he says:

> the direct and unequivocal challenge to the notion of contradiction in standard logic comes when it is claimed that the same proposition is both true and false at the same time in the same sense. This is exactly accomplished by the introduction of the [fourth] value—"Inexpressible", which can also be rendered as paradoxical. (1991: 10–11).

Matilal's intended interpretation seems thus to be:

$$(4) /p/ = \text{u iff } \nabla\ (p,\ \neg p),$$
$$\text{i.e. } /p/ = \text{u iff } \exists\sigma\ (\sigma :p\ \&\ \sigma :\neg p).$$

Matilal's interpretation is a little weaker than Bharucha and Kamat, for he does not explicitly state that the conjunction '$p \& \neg p$' is asserted, only that both conjuncts are. Admittedly, the difference between Matilal and Bharucha and Kamat is very slight, and indeed only exists if we can somehow make out the claim that both a proposition and its negation are assertible without it being the case that their conjunction is. For example, we might think that the standpoint of physical theory can be consistently extended by including the assertion that gods exists, and also by including the assertion that gods do not exist. It would not follow that one could from any standpoint assert the conjunction of these claims. Yet whether there is such a difference between Matilal's position and that of Bharucha and Kamat is rather immaterial, since Matilal's proposal clearly suffers from the precisely the same technical defect as theirs, namely the lack of distinctness between the fourth and fifth values.

I will now offer my own interpretation, which gives an intuitive sense to the truth-value "non-assertible", sustains the distinctness of each of the seven values, but does not require us to abandon the assumption that standpoints are internally consistent. Recall that we earlier introduced the idea of an optimal standpoint, by means of the assumption that for every proposition, either it or its negation is justifiably assertible from within the standpoint. Suppose we now retract that assumption, and allow for the existence of standpoints which are just neutral about the truth or falsity of some propositions. We can then introduce a new value as follows:

$$(4)\ /p/ = \text{u iff } \exists\sigma\neg(\sigma :p)\ \&\ \neg(\sigma :\neg p).$$

Neither the proposition nor its negation is assertible from the standpoint. For example, neither the proposition that happiness is a virtue nor its negation receives any justification from the standpoint of physical theory. We have, in effect, rejected a commutativity rule, that if it not the case that 'p' is assertible from a standpoint σ then '$\neg p$' is assertible from σ, and vice versa [$\neg(\sigma :p)$ iff $(\sigma :\neg p)$]. Our new truth-value, u, is quite naturally called "non-assertible", and it is clear that the fifth value, tu, the conjunction of t with u, is not equivalent simply with u. The degree to which the Jaina system is paraconsistent is, on this interpretation, restricted to the sense in which a proposition can be tf, i.e. both true and false because assertible

from one standpoint but deniable from another. It does not follow that there are standpoints from which contradictions can be asserted.

Why have so many writers on Jaina logic felt that Jaina logic is paraconsistent precisely in the stronger sense? The reason for this belief is the account which some of the Jainas themselves give of the meaning of their third basic truth-value, "non-assertible". As we saw in the passage from Vādideva Sūri, some of them say that a proposition is non-assertible iff it is arguably both true and false *simultaneously*, as distinct from the truth value tf, which is *successively* arguably true and arguably false. We are interpreting the Jaina distinction between successive and simultaneous combination of truth-values in terms of a scope distinction with the operator "arguably". One reads "arguably (t & f)", the other "(arguably t) & (arguably f)". If this were the correct analysis of the fourth truth-value, then Jaina logic would indeed be strongly paraconsistent, for it would be committed to the assumption that there are philosophical positions in which contradictions are rationally assertible. Yet while such an interpretation is, on the face of it, the most natural way of reading Vādideva Sūri's elaboration of the distinction between the third and fourth values, it is far from clear that the Jaina pluralism really commits them to paraconsistency in this strong form. Their goal is, to be sure, to reconcile or synthesise mutually opposing philosophical positions, but they have no reason to suppose that a single philosophical standpoint can itself be inconsistent. Internal consistency was, in classical India, the essential attribute of a philosophical theory, and a universally acknowledged way to undermine the position of one's philosophical opponent was to show that their theory contradicted itself. The Jainas were as sensitive as anyone else to allegations that they were inconsistent, and strenuously denied such allegations when made. I have shown that it is possible to reconstruct Jaina seven-valued logic in a way which does not commit them to a strongly paraconsistent position.

The interpretation I give to the value "non-assertible" is quite intuitive, although it does not mean "both true and false *simultaneously*". My interpretation, moreover, is supported by at least one Jaina logician, Prabhācandra. Prabhācandra, who belongs to the first part of the ninth century C.E., is one of the few Jainas directly to address the question of why there should be just seven values. What he has to say is very interesting (*Prameyakamalamārtaṇḍa*, p. 683, line 7 ff):

> (Opponent:) Just as the values 'true' and 'false', taken successively, form a new truth-value 'true-false', so do the values 'true' and 'true-false'. Therefore, the claim that there are seven truth-values is wrong.
> (Reply:) No: the successive combination of 'true' and 'true-false' does not form a new truth-value, because it is impossible to have 'true' twice. … In the same way, the successive combination of 'false' and 'true-false' does not form a new truth-value.
> (Opponent:) How then does the combination of the first and the fourth, or the second and the fourth, or the third and the fourth, form a new value?
> (Reply:) It is because, in the fourth value "non-assertible", there is no grasp of truth or falsity. In fact, the word "non-assertible" does not denote the simultaneous combination of truth and falsity. What then? What is meant by the truth-value "non-assertible" is that it is impossible to say which of 'true' and 'false' it is.

This passage seems to support the interpretation offered above. When talking about the "law of non-contradiction" in a deductive system, we must distinguish between

two quite different theses: (a) the thesis that "$\neg (p \& \neg p)$" is a theorem in the system, and (b) the thesis that it is not the case that both 'p' and '$\neg p$' are theorems. The Jainas are committed to the first of these theses, but reject the second. *This* is the sense in which it is correct to say that the Jainas reject the "law of non-contradiction".

I showed earlier that when we restrict ourselves to optimal standpoints, the total discourse falls into just one of three possible states with respect to each system. The Jainas have a *seven*-valued logic because, if we allow for the existence of non-optimal standpoints, standpoints which are just neutral with respect to some propositions, then, for each proposition, p say, the total discourse has exactly seven possible states. They are as follows:

(1) p is a member of every standpoint in Σ.
(2) $\neg p$ is a member of every standpoint in Σ.
(3) p is a member of some standpoints, and $\neg p$ is a member of the rest.
(4) p is a member of some standpoints, the rest being neutral.
(5) $\neg p$ is a member of some standpoints, the rest being neutral.
(6) p is neutral with respect to every standpoint.
(7) p is a member of some standpoints, $\neg p$ is a member of some other standpoints, and the rest are neutral.

Although Jainas do not define the states in this way, but rather via the possible combinations of the three primitive values, t, f and u, it is not difficult to see that the two sets map onto one another, just as they did before. Thus t = (1, 3, 4, 7), f = (2, 3, 5, 7), tf = (3, 7), and so on.

Using many-valued logics in this way, it should be noted, does not involve any radical departure from classical logic. The Jainas stress their commitment to bivalence, when they try to show, as Vādideva Sūri did above, that the seven values in their system are all products of combining two basic values. This reflects, I think, a commitment to bivalence concerning the truth-values of propositions themselves. The underlying logic *within* each standpoint is classical, and it is further assumed that each standpoint or participant is internally consistent. The sometimes-made suggestion that sense can be made of many-valued logics if we interpret the assignment of non-classical values to propositions via the assignment of classical values to related items (cf. Haack 1974: 64) is reflected here in the fact that the truth-value of any proposition p (i.e. $/p/$) has two values, the status of p with respect to standpoint σ ('$/p/\sigma$') derivatively has three values, and the status of p with respect to a discourse Σ ('$/p/\Sigma$'), as we have just seen, has seven.

Consider again the earlier example of a jury faced with conflicting evidence from a variety of witnesses. The Jainas would not here tell us 'who dun it', for they don't tell us the truth-value of any given proposition. What they give us is the means to discover patterns in the evidence, and how to reason from them. For example, if one proposition is agreed on by all the witnesses, and another is agreed on by some but not others, use of the Jaina system will assign different values to the two propositions. The Jainas, as pluralists, do not try to judge which of the witnesses is lying and which is telling the truth; their role is more like that of the court recorder, to present the totality of evidence in a maximally perspicuous form, one which still permits deduction from the totality of evidence.

So far so good. But there is another worry now, one which strikes at the very idea of using a many-valued logic as the basis for a logic of discourse. For, when we come

to try and construct truth-tables for the logical constants in such a logic, we discover that the logic is not *truth-functional*. That is to say, the truth-value of a complex proposition such as '*p* & *q*', is not a function solely of the truth-values of the constituent propositions '*p*' and '*q*'. To see this, and to begin to find a solution, I would like briefly to describe the work of the Polish logician, Jaśkowski, who was the founder of discursive logics in the West, and whose work, in motivation at least, provides the nearest contemporary parallel to the Jaina theory.

2. Jaśkowski and the Jainas

Philosophical discourse is globally inconsistent, since there are many propositions to which some philosophers assent while others dissent. The Jainas therefore develop a logic of assertions-made-from-within-a-particular-standpoint, and note that an assertion can be both arguably true, i.e. justified by being a member of a consistent philosophical position, and at the same time be arguably false, if its negation is a member of some other consistent philosophical standpoint. This move is quite similar to that of the founder of inconsistent logics, Jaśkowski, who developed a "discussive logic" in which a proposition is said to be 'discussively true' iff it is asserted by some member of the discourse.

Jaśkowski motivates his paper "Propositional Calculus for Contradictory Deductive Systems" (1948; trans. 1969), by making two observations. The first is that:

> any vagueness of the term *a* can result in a contradiction of sentences, because with reference to the same object X we may say that "X is *a*" and also "X is not *a*", according to the meanings of the term *a* adopted for the moment'

the second is that:

> the evolution of the empirical sciences is marked by periods in which the theorists are unable to explain the results of experiments by a homogeneous and consistent theory, but use different hypotheses, which are not always consistent with one another, to explain the various groups of phenomena (1969: 144).

He then introduces an important distinction between two properties of deductive systems. A deductive system is said to be *contradictory* if it includes pairs of theorems A and ¬A which contradict each other. It is *over-complete*, on the other hand, if every well-formed formula is a theorem of the system. In classical logic, these two properties are conflated; hence the slogan "anything follows from a contradiction". The problem to which Jaśkowski addresses himself, therefore, is that of constructing a non-classical system which is contradictory but not over-complete. In classical logic, given two contradictory theses A, ¬A, we may deduce first that A & ¬A, using the &-introduction or Adjunction Rule, A, B → A&B. Then, since A & ¬A iff B & ¬B for any arbitrary A and B, and since B & ¬B → B from &-elimination or Simplification, A & B → A, it follows that B. More clearly:

(1) A, ¬A
(2) A & ¬A, from 1 by Adjunction.
(3) A & ¬A iff B & ¬B, for any arbitrary A and B.
(4) B & ¬B → B, by Simplification.

(5) A & $\neg$A $\rightarrow$ B, from 3 and 4.
(6) B, from 2 and 5 by Modus Ponens.

To get an inconsistent (contradictory but not over-complete) system, at least one step in this sequence must be broken. In Jaśkowski's new system, 'discursive logic', it is the Adjunction Rule which no longer holds. Jaśkowski considers the system in which many different participants makes assertions, each thereby contributing information to a single discourse. The best example, perhaps, is one already given, the evidence presented to a jury by witnesses at a trial. Jaśkowski then introduces the notion of discursive assertion, such that a sentence is discursively asserted if it is asserted by one of the participants in the discourse, and he notes that the operator "it is asserted by someone that ..." is a modal operator for the semantics of which it should be possible to use an existing modal logic. Thus:

A is a theorem of **D2** iff $\diamond$A,

where **D2** is Jaśkowski's two-valued discursive logic, and "$\diamond$" is the operator "someone asserts that ...". For some reason, Jaśkowski chooses a strong modal system, **S5**, to give the semantics of this operator, but this is surely a mistake. The reason is that the **S5** modal principle 'A $\rightarrow$ $\diamond$A' does not seem to hold for a discursive system, since there will be truths which no-one asserts. It would not be difficult, however, to use a weaker modal system than **S5**, for example $\mathbf{S2^0}$ or $\mathbf{S3^0}$, which lack the above principle, as the basis for **D2**. (The characteristic axiom of $\mathbf{S4^0}$, '$\diamond\diamond$A $\rightarrow$ $\diamond$A', does not seem to hold in a discursive system: it can be assertible from some standpoint that there is another standpoint in which *p* is assertible without there being such a standpoint.) The point to note is that, in most modal systems, the Adjunction Rule fails, since it does not follow that the conjunction A&B is possible, even if A is possible and B is separately possible. And this too, is what we would expect from the discursive operator, for one participant may assert A, and another B, without there being anyone who asserts the conjunction. Jaśkowski therefore arrives at a system which is contradictory, since both A and $\neg$A can be theses, but, because it is non-adjunctive, is not over-complete.

3. The Logical Structure of the Jaina System

The parallels in motivation between Jaśkowski's discursive logic, and the Jaina system are unmistakable. There is, however, an important difference, to which I alluded earlier. Modal logics are not truth-functional; one cannot, for example, deduce the truth-value of '$\diamond$(A&B)' from the truth-values of '$\diamond$A' and '$\diamond$B'. And it seems for the same reason that a discursive logic cannot be truth-functional either. Suppose, for example, that we have two propositions A, and B, both of which are assertible from (possibly distinct) standpoints, and hence both true in the Jaina system. What is the truth-value of A&B? It seems that this proposition could be either true, false, or both. To find a solution to this problem, we must explore a little the relations between many-valued and modal systems.

I would like to offer a defence of the Jaina position here. For simplicity, let us restrict ourselves to the Jaina system with only optimal standpoints and just three truth-values. If my suggested defence works here, its extension to the full Jaina

system **J7**, would not be especially problematic. Consider again the three-valued logic, **M3**, whose values were defined as follows:

$$/p/ = 1 \text{ iff } \forall\sigma\ \sigma : p.$$
$$/p/ = 2 \text{ iff } \forall\sigma\ \sigma : \neg p.$$
$$/p/ = 3 \text{ iff } \exists\sigma\ \sigma : p\ \&\ \exists\sigma\ \sigma : \neg p.$$

These correspond to the three possible states of a totality of optimal standpoints. When we try to construct the truth-table for conjunction in such a system, we find that it is non-truth-functional. Thus, consider the truth-value of '$p\&q$', when $/p/ = /q/ = 3$. Here, $/p\&q/$ might itself be 3, but it might also be 2. Thus, the truth-value of the conjunction is not uniquely determined by those of its conjuncts. What is uniquely determined, however, is that the truth-value belongs to the class (2, 3). To proceed, we can appeal to an idea first introduced by N. Rescher in his paper "Quasi-truth-functional systems of propositional logic" (1962). A quasi-truth-functional logic is defined there as one in which "some connectives are governed by many-valued functions of the truth-values of their variables". The entries in the truth-table of such a logic are typically not single truth-values but sets of values. It is clear that the system set up just now is, in this sense, quasi-truth-functional. Now, as Rescher himself points out, a quasi-truth-functional logic will always be equivalent to a multi-valued strictly truth-functional system. The idea, roughly, is that we can treat a class of truth-values as constituting a new truth-value. Typically, if the quasi-truth-functional system has n truth-values, its strictly truth-functional equivalent will have 2^n-1 values (Rescher notes that "in the case of a three-valued (T, F, I) quasi-truth-functional system we would need seven truth-values, to represent: T, F, I, (T, F), (T, I), (F, I), (T, F, I)" but argues that there are special reasons entailing that for a two-valued quasi-truth-functional system we need four rather than three values.). The seven-valued system which results in this way from the three-valued logic sketched above has, in fact, been studied notably by Moffat (see Moffat and Ritchie 1990, see also Priest 1984). I will therefore call it **M7**. An initially tempting idea is to identify the Jaina system **J7** with **M7**. This, however, will only work if the fourth value, u, is defined thus:

$$/p/ = \text{u iff } \forall\sigma\ \sigma : p\ \vee\ \forall\sigma\ \sigma : \neg p.$$

For then 'tu' in the Jaina system will be identical with '1' in the Moffat system, etc. This is, however, not an interpretation which receives any textual support.

Instead, let us observe that there is a close connection between **M7** and the restricted Jaina system, **J3**. For note that the value (1, 3) in **M7** is such that

$$\begin{aligned} /p/ = (1,3) &\text{ iff } /p/ = 1 \vee /p/ = 3 \\ &\text{ iff } \forall\sigma\ \sigma : p\ \vee\ (\exists\sigma\ \sigma : p\ \&\ \exists\sigma\ \sigma : \neg p) \\ &\text{ iff } \exists\sigma\ \sigma : p. \end{aligned}$$

Thus (1, 3) in **M7** is just the value 'true' in **J3**. Similarly, (1, 2) in **M7** is just the value 'false' in **J3**. Thus, *although **J3** is not strictly truth-functional, its truth-tables are embedded in those of the Moffat logic, **M7***. I have given some of the truth-tables which illustrate this fact in the Appendix.

It is presumably possible to find a quasi-truth-functional system whose truth-tables embed those of **J7**, the full Jaina system, in an entirely analogous way. Thus,

although the loss of Adjunction means that the Jaina logic **J7**, is not truth-functional, its truth-table is embedded in a suitable quasi-functional system. The lack of truth-functionality is not, after all, a fatal flaw in the Jaina approach.

4. Axiomatisation of the Jaina System

We have shown that it is possible to use many-valued truth-tables to formalise the Jaina system. This was, in effect, the approach of the Jaina logicians themselves. Yet it would surely be much better to proceed by axiomatising the modal standpoint operator, ∇. Once again we look to Rescher (*Topics in Philosophical Logic* (1968), chapter xiv). His work on what he calls "assertion logics" is an extension of the work of Jaśkowski. Rescher introduces a system **A1**, with the following axiomatic basis:

(A1)	$(\exists p)\sigma : p$	[Nonvacuousness]
(A2)	$(\sigma : p \,\&\, \sigma : q) \supset \sigma : (p \& q)$	[Conjunction]
(A3)	$\neg\sigma : (p \,\&\, \neg p)$	[Consistency]
(R)	If $p \mid - q$, then $\sigma : p \mid - \sigma : q$.	[Commitment]

Note that one effect of the rule (R) is to ensure that the notion captured is not merely explicit assertion but 'commitment to assert', for (R) states that from a standpoint one may assert anything entailed by another of the assertions. I believe that the Jainas would accept each of the axioms (A1) to (A3). Bharucha and Kamat, it may be noted, would reject (A3), while Matilal, as I have represented him, would reject (A2). I have already argued that these claims are mistaken. In particular, with regard to (A2), although it is true that the Jainas reject Adjunction, what this means is that assertions made from within different standpoints cannot be conjoined, not that assertions made within the same standpoint cannot be conjoined.

We now introduce the modal standpoint operator, ∇ "arguably", via the definition:

$$\nabla p \text{ iff } (\exists\sigma)\sigma : p,$$

and add the axioms of $\mathbf{S3^0}$ or some other suitable modal system.

Rescher defines some further systems by adding further axioms, none of which, I think, the Jainas would accept. For example, he defines **A2** by adding to **A1** the axiom that anything asserted by everyone is true [$(\forall\sigma)\ \sigma{:}p \supset p$]. There is no reason to suppose the Jainas commit themselves to this. The system **J3**, however, is distinguished by the new axiom (A4):

$$\text{(A4)} \quad \neg(\exists\sigma)(\neg\sigma : p \,\&\, \neg\sigma : \neg p) \qquad \text{[Optimality]}$$

Rescher too proposes a "three-valued approach" to assertion logic, via the notion of 'the truth status of the assertion p with respect to an assertor', written '$/p/\sigma$', and the definitions:

$$\begin{aligned} /p/\sigma &= \text{T iff } \sigma : p, \\ &= \text{F iff } \sigma : (\neg p), \text{ and} \\ &= \text{I iff} \neg\sigma : p \,\&\, \neg\sigma : \neg p, \end{aligned}$$

and he shows that using the axioms of **A1**, we can derive a quasi-truth-functional logic for this system. These are not quite the Jaina values, as introduced earlier, for they do

not quantify over standpoints or assertors. It is clear, however, that the Jaina system is of the same type as a modalized Rescher assertion logic. Their innovation is to introduce three truth-values via the definitions given before ($/p/\Sigma = \mathrm{t}$ iff $(\exists\sigma)(\sigma : p)$; $/p/\Sigma = \mathrm{f}$ iff $(\exists\sigma)(\sigma : \neg p)$; and $/p/\Sigma = \mathrm{u}$ iff $(\exists\sigma)(\neg\sigma : p \ \& \ \neg\sigma : \neg p)$, where '$/p/\Sigma$' stands for 'the status of the assertion p with respect to the total discourse Σ'). It is this attempt to take a many-valued approach to the modalised, rather than the unmodalized, version of assertion logic which generates the extra complexity of the Jaina system. I have already noted that, since the axiom "$p \supset \nabla p$" is lacking, the modal structure of the system will be no stronger than that of $\mathbf{S3^0}$. Yet in principle there seems no reason to think that the Jaina system cannot in this way be given an axiomatic basis.

5. Pluralism, Syncretism, and the Many-faceted View of Reality

The Jainas avoid dogmatism and a one-sided view of the world simply by noting that assertions are only justified in the background of certain presuppositions or conditions. It is perfectly possible for an assertion to be justified given one set of presuppositions, and for its negation to be justified given another different set. The Jainas' ingenuity lies in the skill with which they developed a logic of discourse to make more precise this natural idea. However, they also went beyond this, for they added that every standpoint reveals a facet of reality, and that, to get a full description of the world, what we need to do is to *synthesise* the various standpoints. As Matilal puts it, "The Jainas contend that one should try to understand the particular point of view of each disputing party if one wishes to grasp completely the truth of the situation. The total truth ... may be derived from the *integration* of all different viewpoints (1977)". But is this further step, the step from pluralism to syncretism, a coherent step to take? In particular, how is it possible to integrate inconsistent points of view? The point is made by Priest and Routley, who, commenting on the Jaina theory, state that "... such a theory risks trivialization unless some (cogent) restrictions are imposed on the parties admitted as having obtained partial truth—restrictions of a type that might well be applied to block amalgamations leading to violations of Non-Contradiction" (Priest *et al.*, p. 17).

Perhaps we can understand the Jaina position as follows. The so-called 'integration' of two points of view, σ_1 and σ_2, does not mean the creation of some new standpoint, which is the combination of the first two. For this would lead to the formation of inconsistent standpoints unless implausible constraints were placed on what can constitute a standpoint. Instead, what it means is that, if p is assertible from some standpoint σ, then this fact, that p is assertible from σ, can itself be asserted from σ_2 and every other standpoint. In this way, each disputant can recognise the element of truth in the other standpoints, by making explicit the presuppositions or conditions under which any given assertion is made.

If correct, this idea has an interesting consequence. In moving from pluralism to syncretism, the Jainas commit themselves to the claim that we are led to a *complete* account of reality by integrating of all the different points of view. It follows from this that every true proposition must be asserted within some standpoint, i.e. "$p \supset (\exists\sigma)(\sigma : p)$" or "$p \supset \nabla p$". Hence the move from pluralism to syncretism is a move from a logic of assertibility based on $\mathbf{S3^0}$ or weaker to one based on $\mathbf{S3}$ or stronger.

To conclude, we have seen how the Jainas developed a plausible and interesting logic of philosophical discourse, how they did not (or need not) commit themselves to the strongly paraconsistent position normally attributed to them, and how, as

they strengthened their position from one of pluralism to one of syncretism, they had also to strengthen correspondingly the modal logic underlying the operator "*syāt*".

References

Bharucha, F. and Kamat, R. V. 1984. '*Syādvāda* theory of Jainism in terms of deviant logic', *Indian Philosophical Quarterly* **9**, 181–187.
Dundas, P. 1992. *The Jains*. London: Routledge.
Ganeri, J. 2001. 'Rationality, harmony and perspective', in *Philosophy in Classical India: The Proper Work of Reason*. London: Routledge.
Gokhale, P. 1991. "The Logical Structure of *Syādvāda*", *Journal of Indian Council of Philosophical Research* **8**, 73–81.
Haack, S. 1974. *Deviant Logic*. Cambridge: Cambridge University Press.
Jaśkowski, S. 1948. 'Propositional calculus for contradictory deductive systems', *Studia Logica* **24**, 143–157.
Matilal, B. K. 1977. *The Central Philosophy of Jainism*. Calcutta: Calcutta University Press.
Matilal, B. K. 1991. '*Anekānta*: both yes and no?', *Journal of Indian Council of Philosophical Research* **8**, 1–12.
Moffat, D. C. and Ritchie, G. D. 1990. "Modal queries about partially-ordered plans", *Journal of Experimental and Theoretical Artificial Intelligence* **2**, 341–368.
Mukerji, R. N. 1977. "The Jaina logic of seven-fold predication," in A.N. Upadhye, N. Tatia, D. Malvania, M. Mehta, N. Shastri, K. Shastri eds., *Mahāvīra and His Teachings*, Bombay, 225–233.
Prabhācandra. 1941. *Prameyakamalamārtaṇḍa*, M. K. Shastri, ed. Bombay: Nirnayasagar Press.
Priest, G. 1984. 'Hypercontradictions', *Logique et Analyse* **107**, 237–243.
Priest, G., Routley, R. and Norman, J., eds. 1989. *Paraconsistent Logic: Essays on the Inconsistent*. Munchen: Philosophia Verlag.
Rescher, N. 1962. "Quasi-truth-functional systems of propositional logic", *Journal of Symbolic Logic* **27**, 1–10.
Rescher, N. 1968. *Topics in Philosophical Logic*. Dordrecht: Reidel.
Shah, J., Nagin ed. 2000, *Jaina Theory of Multiple Facets of Reality and Truth*Bhogilal Leherchand Institute of Indology, Delhi.
Vādideva Sūri: 1967. *Pramāṇa-naya-tattvālokālaṃkāra*, H. S. Battacharya, ed. and transl. Bombay: Jain Sahitya Vikas Mandal.

Appendix

Some truth-tables for J3

The truth-table for '&' in M7 is as follows:

&	*1*	*2*	*3*	*(2,3)*	*(1,3)*	*(1,2,3)*	*(1,2)*
1	1	2	3	(2,3)	(1,3)	(1,2,3)	(1,2)
2	2	2	2	2	2	2	2
3	3	2	(2,3)	(2,3)	(2,3)	(2,3)	(2,3)
(2,3)	(2,3)	2	(2,3)	(2,3)	(2,3)	(2,3)	(2,3)
(1,3)	(1,3)	2	(2,3)	(2,3)	(1,2,3)	(1,2,3)	(1,2,3)
(1,2,3)	(1,2,3)	2	(2,3)	(2,3)	(1,2,3)	(1,2,3)	(1,2,3)
(1,2)	(1,2)	2	(2,3)	(2,3)	(1,2,3)	(1,2,3)	(1,2)

The embedded truth-table for '&' in J3 is therefore:

&	*tf*	*f*	*t*
tf	f	f	f
f	f	f	f
t	f	f	(t,f,tf)

The truth-table for '⊢' in M7 is:

	1	*2*	*3*	*(1,3)*	*(2,3)*	*(1,2)*	*(1,2,3)*
⊢	1	2	3	(2,3)	(1,3)	(1,2)	(1,2,3)

The embedded truth-table for '⊢' in J3 is therefore:

	tf	*t*	*f*
⊢	tf	f	t